9-4-2008

UM glaciologist projects 21st century sea level rise

University of Montana--Missoula. Office of University Relations

The University of Montana

UNIVERSITY RELATIONS • MISSOULA, MT 59812 • 406-243-2522 • FAX: 406-243-4520

NEWS RELEASE

Sept. 4, 2008

Contact: Joel Harper, UM geosciences assistant professor, 406-243-5867, joel.harper@umontana.edu.

UM GLACIOLOGIST PROJECTS 21ST CENTURY SEA LEVEL RISE

MISSOULA, Mont. –

When Joel Harper talks about calving, it has nothing to do with cattle.

Harper, a University of Montana glaciologist, studies the melting and movement of the world's ice sheets. For him, calving is what happens when ice sheets meet the ocean and break apart to form icebergs.

Now Harper and his research partners suggest there needs to be a whole lot more calving going on to make the direst climate-change predictions of sea level rise – sometimes suggested at 6 meters (19 feet) or more – come to fruition by 2100.

In fact, glaciers and ice sheets would have to reach never-recorded sustained speeds to make the most extreme ocean level rises come true according to the researchers' new methodology, which is laid out in the Sept. 5 edition of the journal Science.

The latest Intergovernmental Panel on Climate Change report projects between 18 to 60 centimeters (7.2 to 24 inches) of sea level rise by 2100. But Harper said that projection has come under criticism for not including ice dynamics – how ice sometimes speeds up and calves more icebergs in response to lubrication from meltwater or warming ocean temperatures.

"We simply don't understand the physics of ice dynamics well enough to make accurate model predictions," he said. "There are just too many uncertainties. So what we did is flip the

problem on its head."

Admitting ice dynamics is an unknown, the researchers worked the problem backward. They asked, "What would the glaciers and ice fields have to do to produce 2 meters of sea level rise by 2100? To produce 5 meters of sea level rise or more?"

"We found you would need to have phenomenal calving," said Harper, who has lived and worked on the Greenland ice cap the past two summers, studying the increased melting there.

He said for the Greenland ice sheet to produce 2 meters of worldwide sea level rise by 2100, the glaciers moving into the island's calving fjords would have to increase their speed to 45.8 kilometers (28.4 miles) per year and sustain that speed until the end of the century.

"For some perspective, the mean velocity right now is about 1.2 kilometers per year," Harper said. "So you would need a 40-something increase in the mean velocity. And this scenario includes increasing the surface melt rate by tenfold."

He said scientists have never seen ice move 45.8 kilometers per year anywhere in the world.

"But we can't prove that it's impossible," he said. "What we can say is that it's not a good working hypothesis. We've seen some glaciers double their ice discharge, and some are going 12 kilometers per year. Fifteen kilometers per year is the fastest we've ever seen one of the Greenland outlet glaciers go, and that one already stopped doing that."

So, armed with this new methodology for dealing with the uncertainty of ice dynamics,

how high do Harper and his partners think world oceans will rise by 2100?

"We think they will rise between .8 and 2 meters (2.7 and 6.7 feet)," he said. "That includes plausible ice dynamics scenarios. To get to 2 meters, that basically requires instant ice acceleration to extreme conditions from Antarctica, Greenland, small glaciers and our biggest projection for thermal expansion of the oceans. And anything over 2 meters is basically untenable."

However, Harper stresses that a rise of even .8 meters is a huge deal. Raising the California Central Valley levees only .15 meter, for example, would cost more than $1 billion.

"We hope our research will help give people a better number to work with," he said. "If we keep thinking along the lines of 6 meters of sea level rise by 2100, we would write off places that are actually savable. We could put our money into building massive walls where they aren't needed instead of concentrating on other things."

Harper said sea levels have come up at phenomenal rates in the past, but that hasn't happened since the last Ice Age.

"All of Canada was covered by a vast ice sheet, and it was calving into the Hudson Bay, which was this huge gate," he said. "We live in a different world today."

Harper's partners in the study and co-authors of the Science article are Tad Pfeffer of the Institute of Arctic and Alpine Research at the University of Colorado and Shad O'Neel of the Scripps Institution of Oceanography at the University of California, San Diego.

###

CBS
Local, state
090408glac